SELECTED RAILWAY CORPORATE STRATEGY INSIGHTS, WITH SPECIAL REFERENCE TO TURKEY

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1. ABSTRACT

Railways are globalizing, transforming themselves from preeminent land transport mode, to one that defines and dominates distinct market spaces. To give insight into the process, the paper presents aspects of original longitudinal research in the railway corporate strategy field, based on statistical analysis of key variables representing the world's entire railway population. It presents a research methodology developed from distinctions among transport modes, and derives railway genetic technologies from them, then applies the findings from factor analysis and cluster analysis to key railway developments in the global railway industry, and also to a railway strategic horizon centred on Turkey.

From a global railway business perspective, the paper examines the drivers of rail's three naturally competitive market spaces, and extends them to regional railway business from four symbiotic regions surrounding Turkey. It concludes by noting that ten factors and four clusters guide positioning of railways for competitiveness and sustainability. Regarding Turkey in a global railway industry context, one can only conclude that it is literally surrounded by opportunities. At the crossroads of many of the ancient and emerging trading routes, railway stakeholders in Turkey are to be encouraged to realize the opportunities that wait on them.

2. INTRODUCTION

Railway corporate strategy as a study field

After World War II, civilian spin-offs from military technologies, and shifting social preferences, changed the competitive balance between road and rail transport. Since then, differences between railway leaders and -followers have widened. The author recognized this phenomenon in the late 1980s, and commenced research in the railway corporate strategy field in the 1990s. The field encompasses those attributes of railways that relate to and influence their technology, as shown in Figure 1. Railways are arguably more asset intensive than any other industry, and their assets are typically long-lived. Railway industry stakeholders must therefore deal with systems that are more complex, with more legacy standards, and with more constraining interfaces, than most other businesses or -industries.

The railway corporate strategy field considers both aspects of the organization-environment interface. From the organization aspect, it addresses an individual railway functioning as a unified whole system with respect to safety, service and sustainability, and management's strategic intent to position it in its environment. From the environment aspect, global in the case of railways, it addresses a railway's contextual awareness of the world-wide diagnostic accumulation of drivers, and its corporate citizenship within that setting. These aspects are known respectively as Stratified Systems Theory Levels V and VI [1]. The field excludes all other aspects of corporate strategy, which though as important to railways as to other businesses, are not unique to them.

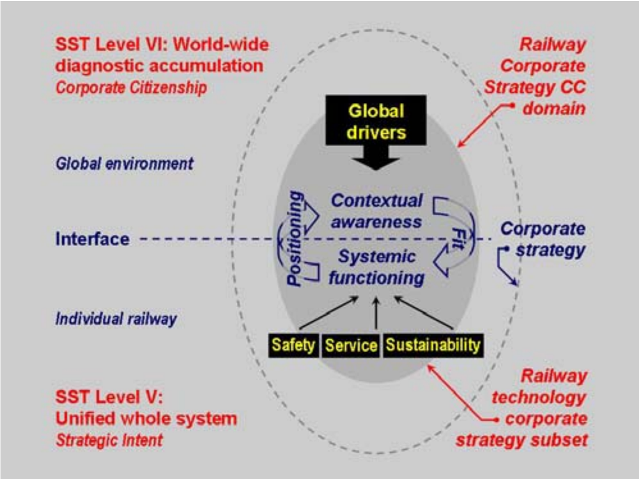

Figure 1 The railway corporate strategy field

Railway globalization

After World War II, railways in many countries were still state-owned. Their objectives were typically couched in social terms, and many did not adapt spontaneously to the shifting environment in which they found themselves. Insulation from competition did not stimulate the continuous organizational introspection, research and development, and culling and renewal of processes and technologies, which promote adaptation. Notwithstanding that, commercial high-speed intercity passenger trains did appear in the 1960s, followed by heavy haul of bulk commodities in unit trains in the 1970s, and double-stack container trains in the 1980s, a course of events that eventually came to be recognized as a railway renaissance. As they changed from regulated institutions to commercialized institutions, the world's railways have inescapably found themselves converging on a new global order. They are transforming, from the preeminent land transport mode, to one that defines and dominates distinct market spaces. Railways exist in a complex, multivariate, economic-, political-, and social space demarcated by many contending poles of command- and free economies, competitive- or monopolistic route structures, open access and vertical integration, heavy haulers and supranationals, monolithic state railways and small independent operators, to mention some. Within it, leading railways have expanded operations and renewed assets, while laggards have atrophied.

A railway corporate strategy research paradigm

The market spaces that railways naturally dominate have become more certain as more railways have converged on them: Those that have entered such spaces have become more sustainable, and those that have not, less sustainable. The adaptation process has not been without turbulence: In some cases, for example the United Kingdom, it required dismantling and restructuring an entire industry, sometimes iteratively in areas where the new design did not work first time out. From the dynamics implicit in Figure 1, turbulence observed across an organization-environment interface provides evidence that affected railways are open systems constructively positioning themselves with respect to global drivers. By contrast, railways that do not have the managerial freedom, or the stakeholder will, to expose themselves to global drivers deplete the entropy in their closed systems, until they no longer relate meaningfully to their business environment. It is thus appropriate to research railway globalization within a behavioural paradigm: The author found that one can extract worthwhile insight by observing the adaptation process.

Extended strategic horizons

This paper is based on original railway corporate strategy research [2]. It applies the findings to key railway developments, with specific reference to both the global railway industry, and the railway strategic horizon centred on Turkey, shown in Figure 2. The justification for the strategic horizon will be developed in Paragraph 4: It is mentioned here simply to outline the scope of this paper.

Figure 2 A Turkey-centric railway strategic horizon

3. KEY RAILWAY ATTRIBUTES

Competitiveness fundamentals

Distinctions among transport modes. For scientific research into railway corporate strategy, it is useful to consider railway competitiveness from a perspective of degrees-of-freedom-of-movement of a transport mode. First, aerial- and submarine transport possess three degrees of freedom of movement: They offer spatial mobility, at relatively high cost. Second, unguided surface transport possesses two degrees of freedom of movement: It trades off reduced mobility against lower cost. Last, guided surface transport possesses only a single degree of freedom of movement, back and forth on a guideway: By itself, such a mode offers limited mobility. To the extent that limited mobility reduces value, railways must offer compensating advantages to hold their own against competing transport modes.

Railway genetic technologies. Guided surface transport is predicated on a vehicle-guideway pair, which ensures precise application of vertical loads, and secure application of lateral loads. In the final analysis, steel-wheel-on-steel-rail contact mechanics develop vertical and lateral force components, technologies that the author named *Bearing* and *Guiding*: They support respectively heavy axle load and high speed. Cross-breaking Bearing and Guiding, in Figure 3, yields four market spaces, of which three are intensely competitive—Heavy Haul, High-speed Intercity, and Heavy Intermodal (or Double Stack)—and in which railways have demonstrated inherent sustainability. One may leverage all four market spaces by linking vehicles, to scale capacity as required, a technology that the author named *Coupling*. Bearing, Guiding, and Coupling are the three *genetic technologies* that distinguish railways from all other transport modes: Railway competitiveness can be measured by the extent to which railways exploit their genetic technologies. One cannot define the three competitive market spaces by hard rules, but the following empirical boundaries fit real railways. Plotting speed on a logarithmic scale, $10^{1.x}$km/h comfortably accommodates most low speed applications, and $10^{2.x}$km/h comfortably accommodates most high speed applications. International Heavy Haul Association Bylaw 4.9 [3] admits permissible axle load of ≥25 tonnes as heavy haul: At its 8th Conference in 2005 in Rio de Janeiro, this threshold was raised to “aspiring to 30 tonnes”, but the new value has not yet been uploaded to its website. For the purpose of this paper, the boundary between light axle load and heavy axle load is therefore proposed as 30 tonnes per axle.

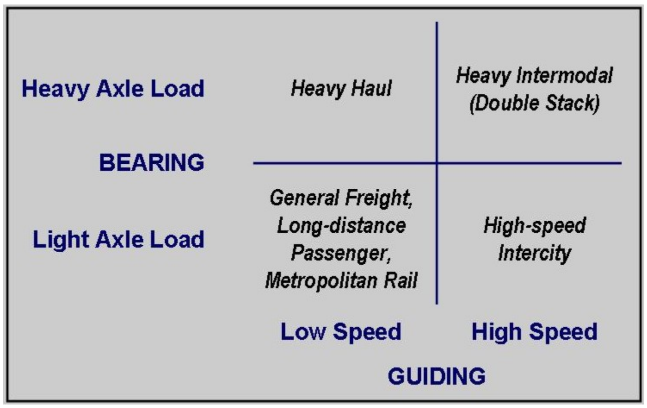

Figure 3 Railway market spaces

One weak market space. The cross-break in Figure 3 also defines one potentially weak market space—light axle load in combination with low speed: It is exemplified by general freight-, traditional long-distance passenger-, and metropolitan rail applications. General freight- and long-distance passenger traffic tend to share infrastructure and operations in monolithic railway administrations. Their natural speed differential results in contention for line capacity, while their natural riding quality differential results in contention for permissible axle load. Neither traffic type can exploit its full potential, which imposes an opportunity cost that competitive modes do not face. Railways that cannot offer significant advantage over competitive modes struggle. Line-haul railways that fail to exploit their genetic technologies are weak, hence competitors erode their markets. Depending on whether economic-, political-, or social objectives determine their destiny, they are respectively eliminated, protected, or subsidized.

Metropolitan Rail. The criteria by which metropolitan rail is positioned differ from those of line-haul railways in so many respects, that it is virtually a distinct mode. It resides in the weak market space, but is nevertheless a popular and valuable solution in many cities. The Coupling genetic technology makes possible short headways, which would be unrealistic with autonomous vehicles, by combining them into trains. Its advantages thus typically relate to capacity, by exploiting, and hence leveraging the output from each slot in a timetable. Note that this paragraph recognizes all railway variants that are encountered in practice—heavy rail, light rail, metro, tram, and so on, or any combination of them.

Critical distinctions among railways

Comparing railway settings. The research on which this paper is based [2] defined cases by country, because railways are generally legitimized by national legislation. The global population of line-haul railway countries barely exceeds one hundred, while statistical significance demands a fair case-to-variable ratio: One can therefore only compare railways globally at high level. Longitudinal analysis, over the years 2002 through 2005, leveraged the number of cases, and hence also the admissible number of variables. Filtering out non-essential detail, around forty variables, as in Table 1, were sufficient to exhaustively describe essential distinctions among countries and their railways. Appreciate that several scales have intermediate values. Public-domain observations readily support behavioural research, and avoid the need to obtain proprietary data. The hard data were extracted from trade directories, the soft data by content analysis of trade periodicals. A new, dedicated, data base was then created using metric- and nonmetric data. Interested readers may download the full definitions, scales, and database from www.railcorpstrat.com. Note that the research excluded metropolitan railways for the reasons mentioned in the previous paragraph. Despite the complex issues captured in the database, multivariate statistical techniques are able to extract mathematically rigorous, comprehensible relations. The researcher must nevertheless interpret their outcomes in the light of knowledge about the setting.

Table 1 List of variables and their scales

Group	**Variable**	**Upper Scale Pole**	**Lower Scale Pole**
Competitiveness	Research & Development Level	industry leader	base technology
	Relative Maximum Axle Load	relatively high number	relatively low number
	Relative Maximum Speed	relatively high number	relatively low number
	Distributed Power Presence	present	absent
	Heavy Haul Presence	present	absent
	High-speed Intercity Presence	present	absent
	Double Stack Presence	present	absent
	Diesel Traction	present	absent
	Electric Traction	present	absent
	Attitude to Competition	enabling	protective
Market	Route Diversity	parallel options	single only
	Operator Diversity	open access	monopolistic
	Concerned Stakeholder Sensitivity	concerned	complacent
Networkability	Narrow Gauge	relatively high number	relatively low number
	Standard Gauge	relatively high number	relatively low number
	Broad Gauge	relatively high number	relatively low number
	Networkability	relatively high number	relatively low number
	Strategic Horizon	intercontinental	national
Ownership	Infrastructure-operations Separation	separated	integrated
	Infrastructure Ownership Locus	private	public
	Rolling Stock Ownership Locus	private	public
	Infrastructure Commitment Horizon	long term	medium term
	Rolling Stock Commitment Horizon	long term	medium term
Presence	Route km	relatively high number	relatively low number
	Freight Traffic Volume	relatively high number	relatively low number
	Passenger Traffic Volume	relatively high number	relatively low number
	Employee Count	relatively high number	relatively low number
Society	National Economic Freedom	relatively high number	relatively low number
	National Population	relatively high number	relatively low number
	Gross National Income	relatively high number	relatively low number
	Country Physical Size	relatively high number	relatively low number
	Initiative Source	railway industry	society
	Determinism	authoritarian	laissez faire
Sustainability	Infrastructure Investment Capacity	expansion	abandonment
	Rolling Stock Investment Capacity	expansion	abandonment
	Stakeholder Satisfaction Level	high satisfaction	no satisfaction
	Service Reputation	positive	negative
	Safety Reputation	positive	negative
	Subsidy Influence	toward receiver	toward provider
Time	Calendar Year	2005	2002

Factor analysis. The first statistical technique, *factor analysis*, reduces relations among a large number of variables, as in Table 1, to a smaller number of common underlying factors. The compressed factor loading matrix, in Table 2, shows each variable loading onto one of only ten underlying factors. Noting that the variable Time in the data set spanned four years, the following interpretations explain the discretionary names, with due regard for passage of time:

Factor 1, *Societal Orientation*, suggested a corporate citizenship associated primarily with people. It suggested high-speed, high-tech, intense railway application. Freight traffic also loaded onto it, suggesting that such railways also accommodate mixed traffic. It reflected the Western European passenger-dominated archetype.

Factor 2, *Territorial Orientation*, suggested a corporate citizenship associated primarily with line-haul freight. It suggested liberal competition among technologically-savvy railways with strong private participation. It reflected the competitive North American archetype, with long, heavy trains conveying bulk commodities or high-value goods over long distances.

Table 2 Factor loading matrix (compressed), showing Factors 1 to 10

Factor	Loading	Variable
1	0.89	Employee Count
	0.82	Route Kilometers
	0.79	Passenger Traffic Volume
	0.68	Freight Traffic Volume
	0.67	Electric Traction
	0.65	Relative Maximum Speed
	0.61	National Population
	0.54	Concerned Stakeholder Sensitivity
	0.48	High-speed Intercity Presence
2	0.90	Route Diversity
	0.86	Double Stack Presence
	0.84	Heavy Haul Presence
	0.82	Distributed Power Presence
	0.63	Relative Maximum Axle Load
	0.58	Rolling Stock Ownership Locus
	0.54	Country Physical Size
3	-0.86	Narrow Gauge (kilometers)
	0.75	Networkability
4	0.84	Economic Freedom
	0.73	Gross National Income
	-0.39	Stakeholder Satisfaction Level
5	0.75	Infrastructure-operations Separation
	0.54	Operator Diversity
	0.53	Infrastructure Ownership Locus
	0.51	Service Reputation
	0.36	Strategic Horizon
6	-0.88	Rolling Stock Commitment Horizon
	-0.82	Infrastructure Commitment Horizon
7	0.70	Calendar Year
	0.65	Infrastructure Investment Capacity
	0.58	Rolling Stock Investment Capacity
8	0.71	Subsidy Influence
	0.60	Attitude to Competition
	0.51	Research and Development Level
9	0.77	Initiative Source
	0.65	Safety Reputation
	-0.44	Determinism
10	-0.81	Broad Gauge (kilometers)
	0.53	Standard Gauge (kilometers)

Factor 1 and Factor 2, which together accounted for most of the variance in the underlying data, revealed a watershed distinction among railways: Passenger railways require large populations, which is why they can flourish in geographically confined market spaces, such as Japan, whereas freight railways require large spaces, which is why they can flourish, in geographically expansive market spaces, such as North America.

Factor3, *Global Networkability*, on which Narrow Gauge loaded negatively, suggested the intuitively obvious interpretation that sub-standard gauge track impedes continental- and intercontinental networkability.

Factor 4, *Rising Expectations*, on which Stakeholder Satisfaction Level loaded negatively, suggested that a free, developed, economy nurtures demanding logisticians and passengers, which nurture rising expectations.

Factor 5, *Competitive Freedom*, suggested that transformation from state ownership to private participation associates with good, ultra-long-haul, service.

Factor 6, *Continuous Improvement*, on which both variables loaded negatively, suggested that relatively short commitment horizons maximize the objective function, by encouraging up-to-date capital assets and/or effective public-private partnerships.

Factor 7, *Inherent Sustainability*, suggested that timely asset renewal or -expansion associates with inherent sustainability. By contrast, railways that show signs of deterioration, withdrawal or abandonment are unsustainable: For them, time is running out.

Factor 8, *Government Encouragement*, suggested the intuitively obvious interpretation that government encouragement, through subsidy influence and enabling competition, associates with developing railway genetic technologies to industry-leadership level.

Factor 9, *Self Regulation*, on which Determinism loaded negatively, suggested that railway self regulation associates with positive safety reputation in a laissez faire society: Railway operators who compete for custom and funding simply cannot afford the catastrophic accidents that might occur in protected railways.

Factor 10, *Broad-gauge Conundrum*, on which Broad Gauge loaded negatively, suggested that, despite arguable technical superiority, Broad Gauge opposes the critical mass of Standard Gauge. Thus market dominance outweighs technological advantage.

Cluster analysis. The second statistical technique, *cluster analysis*, reduced all the cases, or countries, to a smaller number of clusters that exhibit within-cluster homogeneity, and between-cluster heterogeneity. The technique assigns the total population to a discretionary number of clusters, of which four were selected for this article. They are shown with thumbnail descriptions of their characteristics in Table 3.

Table 3 Railway clusters

Cluster 1 Constrained Railways	**Cluster 2 Railways in Intense Competition**	**Cluster 3 Railways in Privatization**	**Cluster 4 Railways in Emerging Economies**
All countries except those in Clusters 2, 3 and 4 (77% of total count)	Australia, Canada, United States, Mexico	Austria, Czech Rep., Italy, Sweden, Belgium, Netherlands, Switzerland, Denmark, Norway, Finland, S. Korea, Luxembourg, Germany, UK, Japan	Brazil, South Africa, China, India, Russia (all International Heavy Haul Association members)
Low freight and/or passenger traffic volume	Freight traffic dominates	Mixed traffic, moderate-volume freight, high-volume passenger	Substantial freight traffic, plus significant passenger traffic
Low operator- or route diversity	High operator- or route diversity	Operator diversity rising	Monopolistic markets
Low networkability, national strategic horizon	High networkability, continental strategic horizon	High networkability, conservative strategic horizon	Relatively low networkability, conservative strategic horizon
Low technology, members do not exploit rail's competitive strengths	High technology, exploiting freight competitive strengths (heavy axle load, double-stack, distributed power)	High technology, members deploy rail's high-speed competitive strength	Relatively high tech, occuping at least one competitive space (heavy haul, high-speed intercity, double-stack trains)
Public ownership, long commitment horizons	Private sector ownership dominates, relatively long commitment horizons	Emerging private sector ownership, moderate commitment horizon	Public ownership, relatively short commitment horizon
Low economic freedom, relatively low national income	Relatively high economic freedom, relatively high national	Relatively high economic freedom, moderate-to-high	Low economic freedom, low national income
Low sustainability	Relatively high sustainability	Moderate-to-high sustainability	Relatively high sustainability

Note that the paper length limit does not permit discussion of all the factors and clusters: They are nevertheless presented in their entirety for the sake of completeness and interest.

4. GLOBAL RAILWAY BUSINESS

Rail's naturally competitive market spaces

Having reducing a large initial number of variables and cases to only ten underlying factors and four representative clusters, one can apply the resulting insight to specific situations. From Paragraph 3, it is evident that although Heavy Haul, High-speed Intercity, and Heavy Intermodal share the same fundamental technologies, their essence is so different that they are virtually distinct modes. In chronological order of appearance, they compare as follows:

High-speed Intercity

High-speed Intercity requires wide curves to allow high speeds, but accepts relatively steep gradients because of its high momentum and -power. High-speed Intercity thus ideally requires new, dedicated infrastructure to fully exploit rail's genetic technologies. Happily, building dedicated high speed lines releases legacy infrastructure for recycling to heavy freight. High-speed intercity competes against *road and air* in the 300-1000km mobility market space. At the lower limit, private cars and regional public transport offer more competitive mobility solutions: At the upper limit, air transport is more competitive.

Heavy Haul

Heavy Haul requires easy gradients, to limit coupler forces in heavy trains, but accepts relatively tight curves, because its permissible maximum speed is relatively low. It typically conveys bulk commodities, which are sufficiently dense that a high, competitive axle load can be achieved within a modest loading gauge. Heavy Haul competes against sources *in other countries or other regions* over haul distances of less than 1000km.

Heavy Intermodal

Heavy Intermodal is similar to Heavy Haul, except that it requires high vertical clearance: Unless routes have been purpose-built for double-stacked containers, they typically require special clearance. Furthermore, it typically runs at higher speed, due to the high time value of containerized freight, hence the axle load may be slightly lighter than for Heavy Haul. Intermodal transport has long been pursued, to combine the most desirable characteristics of each constituent mode. Sometimes, changing mode is unavoidable, for example where maritime- and land transport meet. Other times, competing modes may offer a choice, for example overland movements, either entirely by road, or by road at origin and/or destination combined with an intermediate rail sector. Intermodal transfer incurs a cost, so the smaller the margin between rail and the other mode, the longer the rail haul required to break even. If the rail axle load is not sufficiently heavy, it may not break even at all. Empirically, this situation can occur when containers are single-stacked, or when swap bodies or road vehicles are conveyed on railway wagons, and the resulting rail axle load is simply not heavy enough to compete head-to-head against road. The reasoning is no surprise: All else being equal, if heavy axle load is a genetic strength that differentiates rail from road, then it is axiomatic that carrying road vehicles, road vehicle loads, or swap bodies, on trains cannot be competitive, unless the lading is densified to leverage axle load from the road domain to the rail domain. At present, the only effective way of densifying high value goods is to double stack the containers in which they are conveyed. One reaction is that traffic available for double stacking might be insufficient on a particular route. Sustainability of such operations is usually questionable in the first instance, so one can infer that if there is insufficient container traffic to justify a heavy intermodal service, it is arguably not a railway task at all.

Heavy Intermodal competes against *road- and maritime transport* in the 3000-12000km market space, thus accounting for the 3000-km-radius Turkey-centric strategic horizon in Figure 3. It clearly has many other determinants as well, such as interoperability, missing links, political relations, trade flows, and so on, and potentially it could extend much further than 3000km. But it does provide a basis on which to develop a globally-aware railway positioning strategy. It also indicates why the Heavy Intermodal market space is crucial to railway network growth—the two other market spaces max out at haul distances of around 1000km, whereas Heavy Intermodal supports significantly wider continental- and intercontinental networking.

Adaptation processes

Relating rail's three naturally competitive market spaces (Heavy Haul, High-speed Intercity, and Heavy Intermodal) to the factor and cluster analyses, it is evident that predictable adaptation processes will take place. First, passenger and freight railways, sharing the same infrastructure, are uncomfortable bedfellows. Although many railways have historically developed as monolithic organizations, it is sensible to bear in mind that Factor 1 and Factor 2 suggest that they really should exploit their respective strengths separately, as opportunities for new investment and upgrading arise, to fully leverage rail's franchise. Second, Cluster 1, Constrained Railways, will tend to migrate to one of the other more sustainable clusters, as liberal values demonstrate their beneficial influence on railways.

5. REGIONAL RAILWAY BUSINESS

Turkey—position, position, position

To quote a maxim from the real estate business, the most important attributes of a property are position, position, and position. This paper will now develop a case that Turkey is particularly well positioned from a global railway perspective, due to its standard gauge and proximity to key great circle routes [4]. Several significant streams are evident within the influence area of Figure 3. They will be examined below, going clockwise from the North.

Networking

Europe. From a corporate strategy perspective, European railways are now at a fascinating juncture. Both High-speed Intercity and Metropolitan Rail are well founded. Separating freight and passenger businesses and operations, and repositioning state railways into a competitive milieu, are critical strategic challenges. In addition, rail freight market share is disappointingly low. Freight- and passenger service requirements are in contention—until now passenger requirements have dominated strategic direction, at the expense of competitiveness for freight traffic. Factor 1 and Factor 2 clearly show that freight- and passenger service requirements should be addressed independently: When national strategic horizons still dominated railways, this was understandable, but a pan-European territorial orientation has shifted the agenda. In particular, the question of dedicated freight corridors is now being examined by the New Opera Project. Funded by the European Union, it includes major industry participants—a leaders club of freight and logistics companies, with shippers, train operators and infrastructure companies all involved [6]. It envisions many elements of Factor 2, namely diesel traction, 100km/h maximum technical speed, 30 tonnes axle load, huge capacity, double stack, 7‰ maximum gradients, hub and spokes, interchanges, and an axes philosophy [5]. From origins in the United States, heavy intermodal service has already spread to Canada and Mexico, Australia, Saudi Arabia, and China, while India [7] and Russia [8] are exploring it—i.e. all continents except Africa and South America. Evidently it is the most competitive way of moving containers, so Europe is unlikely to be able to afford not to participate. The Trans-European transport networks have several corridors reaching toward neighbouring regions. TEN-T Corridor IV, from Germany and Austria to Greece and Turkey, is particularly relevant. The outcome of the New Opera Project will thus be significant for Turkey: Without preempting it, emergence of dedicated rail freight corridors in Europe will come as no surprise. They have the potential to substantially increase inter-regional rail freight through ultra-long-haul heavy intermodal traffic.

Central Asia. Moving to Central Asia, one finds the fascinating Iron Silk Road between East Asia and Western Europe. At present it offers the shortest gap between the standard gauge railway networks of the two regions. Developing transit traffic is thus important [9], and the Transport Corridor Europe-Caucasus-Asia has been redeveloping appropriate infrastructure for several years. The first example of Factor 10, Broad Gauge Conundrum, is found here. The 1520mm track gauge of the Commonwealth of Independent States extends as far south as the Turkmenistan-Iran border. Kazakhstan is thus exploiting its position, by building a railway to close the standard gauge gap between China and Western Europe. Once again, Turkey is well positioned to gather external transit traffic business from that development.

South Asia. Moving to South Asia, or the Indian Sub-continent, one finds India awakening as a global power. Its economy is expanding rapidly, among other by manufacturing high-added-value physical goods, such as automotive products, which have potential to support double-stack container trains. India has colossal railways, which are nevertheless in a state of flux [10] as the challenges of globalization and high economic growth bear on strategic railway decisions. One of them is Factor 10, the Broad Gauge Conundrum, which associates with its 1676mm track gauge. Indian Railways is upgrading railways in its Golden Quadrilateral, linking New Delhi, Mumbai, Chennai, and Kolkota: Word in the industry is that it is even contemplating standard-gauge for that development. Having already commenced migrating from a three-gauge policy to a single, though broad gauge, policy, such thinking represents a significant departure. Yet, around the world countries have recognized that globalization brings conformity—Spain, Portugal, and Kazakhstan are examples that have committed to standard gauge in the present century—and that non-conformity marginalizes railways because non-standard equipment introduces entry and exit barriers that raise total costs. Western Europe must be a potential market for India's rising economic output. The great circle route[1] between them passes over the Caspian Sea and Black Sea: The standard gauge railway route from the Iran/Pakistan border all the way to Europe lies just to the south of them, with small portions still under construction. If India's new Golden Quadrilateral railway turns out to be standard gauge, the standard-gauge transit gap through Pakistan would be around 1600km, small on the scale of global railway networking, but potentially of enormous value to Turkey as a transit country.

Middle East-North Africa. Moving to the last region, MENA has accelerated railway development in recent years. Iran has positioned itself as a rail transit country [11], for both north-south and east-west traffic. It is particularly well positioned as a standard gauge link between East Asia and Western Europe. To the south, Saudi Arabia is constructing its Landbridge and North-South railways. It already operates double-stack container trains, and the new lines will introduce the remaining two naturally competitive market spaces, High-speed Intercity and Heavy Haul. Saudi Arabia will then be one of the few countries to have a presence in all three naturally competitive rail market spaces. Further on into Africa, the Libyan connection, when complete, should link the Middle East through to Morocco. Turkey is well positioned to gather external transit traffic business from such developments.

6. CONCLUSIONS

In general

The author has presented selected insights from research in the field of railway corporate strategy, by way of ten factors and four clusters, which guide positioning railways for competitiveness and sustainability. Railways are in renaissance in many regions of the world, and those that exploit the strengths of their genetic technologies, Bearing, Guiding, and Coupling, are well placed to take advantage of railway globalization. Railways can now confidently position themselves to dominate one or more of three naturally competitive market spaces, namely Heavy Haul, High-speed Intercity, and Heavy Intermodal.

Regarding Turkey

Applying the foregoing to Turkey within a global context, one can only conclude that it is literally surrounded by railway opportunities. It is particularly well situated to exploit potential growth in high value transit traffic conveyed in containers. While transit traffic has existed since the early days of railways, global railway business is bringing new meaning to the word *transit*. Whereas transit corridors might previously have spanned one intermediate country, routes are now emerging where five or more intermediate countries could be involved. At the crossroads of many of the ancient and emerging trading routes, railway stakeholders in Turkey are to be encouraged to realize the opportunities that surround them.

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